



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
-----------------	-------------	----------------------	---------------------	------------------

10/553,573

10/17/2005

Christian Dussarrat

Serie 6070

1576

40582

7590

07/24/2009

AIR LIQUIDE

Intellectual Property

2700 POST OAK BOULEVARD, SUITE 1800

HOUSTON, TX 77056

EXAMINER

BURKHART, ELIZABETH A

ART UNIT

PAPER NUMBER

1792

MAIL DATE

DELIVERY MODE

07/24/2009

PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

DETAILED ACTION

1. Claims 18-35 are pending in the application. The amendment filed 5/5/2009 has been entered and carefully considered.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
 2. Ascertaining the differences between the prior art and the claims at issue.
 3. Resolving the level of ordinary skill in the pertinent art.
 4. Considering objective evidence present in the application indicating obviousness or nonobviousness.
2. Claims 18, 19, 21, 24-28, and 32-35 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sato et al (US 2001/0048973).

Sato teaches a method of producing a silicon nitride film by CVD comprising: feeding a hydrazine gas and a silicon-containing precursor gas into a reaction chamber wherein a substrate is located within said reaction chamber and forming a silicon nitride film on said substrate by reacting said hydrazine gas with said silicon-containing precursor gas [0030]-[0037].

Sato does not specifically teach feeding a hydrazine gas and a silylhydrazine or trisilylamine as the silicon containing precursor gas. However, Sato does teach that any silicon compound may be used that is suitable for CVD [0031] and that silylhydrazines may be formed in a preliminary reaction chamber and then fed to the reaction chamber [0062]. Thus, it would have been obvious to one of ordinary skill in the art at the time of invention by applicant to use silylhydrazines as the silicon-containing precursor in the process of Sato since it would have been a suitable precursor for silicon nitride deposition as is apparent in [0068] and Ex. 1 and Sato discloses that the type of silicon compound is not critical and any compound suitable for CVD may be used.

Regarding Claims 19 and 28, Sato discloses a silylhydrazine defined by the claimed formula [0068].

Regarding Claim 21, Sato discloses the use of hydrazines defined by the claimed formula [0032]-[0034].

Regarding Claims 24, 25, 32, 33, and 35, Sato discloses the temperature during the CVD process is 500°C-800°C and the pressure is 0.1-760 torr [0036].

Regarding Claims 26, 34, and 35, Sato discloses that an inert gas may be fed to the reaction chamber as a carrier gas (Ex. 1).

Regarding Claim 27, Sato discloses that the silicon-containing precursor gas may be fed into the reaction chamber and decomposed to form the silicon nitride film [0073]-[0081] and that silylhydrazine may be formed in a preliminary chamber and then fed to the reaction chamber [0068].

Art Unit: 1792

Thus, claims 18, 19, 21, 24-28, and 32-35 would have been obvious within the meaning of 35 USC 103 over the teachings of Sato.

3. Claims 18, 21, 24, 25, 26, and 35 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sato et al (US 2001/0048973) as applied above in view of Ishikawa (JP 06338497).

Sato does not disclose that the silicon-containing precursor gas may be trisilylamine.

Ishikawa teaches a CVD method of depositing silicon nitride wherein trisilylamine is reacted with ammonia (Abstract).

It would have been obvious to one of ordinary skill in the art at the time of invention by applicant to use trisilylamine gas as suggested by Ishikawa as the silicon-containing precursor gas in the process of Sato since Sato discloses that any silicon-containing gas suitable for CVD may be used and trisilylamine would have been suitable for CVD as evidenced by Ishikawa.

Thus, claims 18, 21, 24, 25, 26, and 35 would have been obvious within the meaning of 35 USC 103 over the combined teachings of Sato and Ishikawa.

4. Claims 20, 22, 23, and 29-31 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sato et al (US 2001/0048973) as applied above in view of Fessenden et al.

Sato discloses that the silylhydrazine may be formed by the reaction of disilane and monomethylhydrazine [0068]. Sato does not disclose that the silylhydrazine may be formed by reacting silylamine gas with a hydrazine gas.

Art Unit: 1792

Fessenden teaches a silylamine gas may be reacted with a hydrazine to form a silylhydrazine, wherein a trimethylsilylhydrazine compound was formed by the reaction of hexamethyldisilazane and a phenylhydrazine (p. 4638-4639).

It would have been obvious to one of ordinary skill in the art at the time of invention by applicant to form the silylhydrazine of Sato using a silylamine gas as suggested by Fessenden since the silylamine gas would have been a suitable alternative for disilane in producing a silylhydrazine.

Regarding Claims 22 and 31, it would have been obvious to one of ordinary skill in the art to use other combinations of silylamines and hydrazines, other than those exemplified in Fessenden, to form a desired silylhydrazine, especially since silylamines having the claimed formula were known in the CVD art as evidenced by Schuh et al. (p. 1348).

Thus, claims 20, 22, 23, and 29-31 would have been obvious within the meaning of 35 USC 103 over the combined teachings of Sato and Fessenden.

Response to Arguments

5. Applicant's arguments filed 5/5/2009 have been fully considered but they are not persuasive. Applicant argues that while [0031] of Sato states that "any silicon compound" may be used, such language is overly broad and therefore does not support the 103(a) rejection since there are a nearly infinite number of silicon containing compounds which could be suitable for a CVD type deposition. The examiner disagrees. While the teaching in Sato that "any silicon compound can be used...as long as it can be used for chemical vapor deposition" is very broad, Sato also discloses

Art Unit: 1792

preferable examples in [0031] and discloses other precursors for CVD of silicon nitride having the desired properties in [0068], [0070], and [0073]. Therefore, while the recitation of "any silicon compound" is broad, one of ordinary skill in the art would have readily envisaged using any of the silicon compounds disclosed in Sato, including silylhydrazines [0068], since these precursors would have reasonably been expected to produce a silicon nitride film having the desired properties (e.g. thickness uniformity, high productivity, free of aluminum chloride, etc).

Applicant argues that Ishikawa teaches away from the invention since Ishikawa discloses a combination of trisilylamine and ammonia. The examiner disagrees. Sato discloses that the silicon compound may be reacted with ammonia and/or hydrazine [0034], [0043]. Thus, the fact that Ishikawa reacts the trisilylamine with ammonia to form silicon nitride would not teach away from the process of Sato since Sato discloses that ammonia may also be used.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Elizabeth Burkhart whose telephone number is (571)272-6647. The examiner can normally be reached on M-Th 7-5:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Timothy Meeks can be reached on 571-272-1423. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for

Art Unit: 1792

published applications may be obtained from either Private PAIR or Public PAIR.

Status information for unpublished applications is available through Private PAIR only.

For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Elizabeth Burkhart/
Examiner, Art Unit 1792

/Timothy H Meeks/
Supervisory Patent Examiner, Art Unit 1792